CONTROLLER FOR LUMINANCE OF LED

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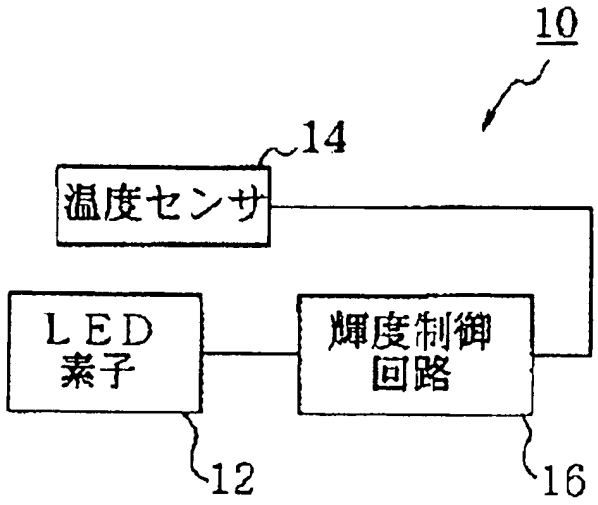
Abstract of **JP2001312249**

PROBLEM TO BE SOLVED: To control so as to maintain the visibility of an LED(light emitting diode) display as much as possible while attaining a long life of LED elements. SOLUTION: The ambient temperature of an LED element 12 is detected by a temperature sensor 14 and when the luminance control circuit 16 of this controller judges that the ambient temperature exceeds a first reference temperature (60 deg.C), the controller controls so as to reduce the light emission luminance of the LED element 12 at a fixed rate by changing a duty ratio while thinning out the driving signal at a fixed rate. The controller continues a lighting control in a state in which the luminance of the element 12 is reduced until the ambient temperature of the element 12 becomes a temperature equal to or lower than a second reference temperature (30 deg.C) by detecting the ambient temperature with the sensor 14. When the ambient temperature is lowered to a temperature equal to or lower than the second reference temperature, the controller performs control so as to return the duty ratio to the original state in order to light the element 12 with a normal luminance. Moreover, when the element 12 is lighted with the normal luminance and the ambient temperature of the element 12 becomes a temperature equal to or higher than the first reference temperature, the controller repeats the control to reduce the luminance of the element 12 at the fixed rate by changing the duty ratio again.



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DETAILED DESCRIPTION

[Detailed Description of the Invention]
[0001]
[Field of the Invention] This invention relates to LED brightness control equipment, and relates to the LED brightness control equipment which performs brightness control for carrying out reinforcement of the LED component in more detail.
[0002]
[Description of the Prior Art] Although there were various things in the emitter which can emit light conventionally, light emitting diode (LED:Light Emitting Diode) came to be made from semiconductor technology in recent years. This LED is a crystalline with a PN junction, and when forward voltage is impressed to this crystalline, N field to an electron is a light emitting device which an electron hole moves to a PN junction, and an electron and an electron hole recombine, and emits light in that case from P field. The color which an LED component emits is decided with the class and additive of a crystal. Generally, red and a green LED component are used frequently and have so far been used for the application of the object for a display, an LED lamp, or a LED display. However, recently, it comes to appear on the market cheaply, red, blue, and the color display using the three primary colors of a green light also become possible, and the use range of an LED component has expanded further the blue LED component with more short wavelength etc.
[0003]
[Problem(s) to be Solved by the Invention] However, although there is an advantage that such a conventional LED component has the part which is not using the filament compared with other emitters (for example, an incandescent lamp, a fluorescent lamp, etc.), and a long life, and the calorific value and power consumption at the time of luminescence are small, and end, the life that luminescence brightness still falls by aging exists, and also has generation of heat at the time of luminescence. Especially as for the life (brightness) of an LED component, the ambient temperature of LED showed being influenced greatly, and when the vicious circle which raises ambient temperature further by generation of heat of the LED component itself arose, there was a problem that the life of an LED component became short. Moreover, this tended to become remarkable by the case of the LED display panel which has arranged much LED in the shape of a matrix, and since it came to have emitted a big heating value when it was collected as a whole even if the calorific value of each LED component was small, it had the problem that the rise of ambient temperature became remarkable. Then, a gone up part of ambient temperature is also taken into consideration, and if it drives where the brightness of an LED component is always reduced and brightness will always be dropped although the rise of the ambient temperature of an LED component can also be prevented, the new problem of becoming the display which it is always dark and is hard to see will be produced. It aims at offering the LED brightness control equipment which can maintain the visibility of an LED display as much as possible, this invention being made in view of the above-mentioned technical problem, and attaining reinforcement of an LED component.
[0004]
[Means for Solving the Problem] Invention according to claim 1 has been arranged near an LED

component and said LED component, and is equipped with a temperature detection means to detect the temperature of the LED component concerned, and a brightness control means to control the brightness of said LED component based on the temperature detected with said temperature detection means. Since the brightness of an LED component was controlled based on the temperature which has arranged the temperature detection means near the LED component, detected the temperature of an LED component, and was detected with the temperature detection means with the brightness-control means according to this, while the ambient temperature of an LED component goes up too much and making it a life not become short, it can return to the usual brightness and visibility can make good at the temperature which does not have a bad influence on a life. In LED brightness control equipment according to claim 1, invention according to claim 2 controls said brightness control means to reduce the brightness of said LED component at a fixed rate, when the temperature to which said temperature detection means exceeds the 1st reference temperature is detected. According to this, since it will control to reduce the brightness of an LED component at a fixed rate if the temperature to which a temperature detection means exceeds the 1st reference temperature is detected, as a brightness control means does not exceed the 1st reference temperature which has big effect on the life of an LED component, it can attain reinforcement of an LED component. In LED brightness control equipment according to claim 2, invention according to claim 3 will control said brightness control means to return the brightness of said LED component which was being reduced at a fixed rate to the original brightness, if the temperature to which said temperature detection means is less than the 2nd reference temperature lower than the 1st reference temperature is detected. If the temperature to which a temperature detection means is less than the 2nd reference temperature lower than the 1st reference temperature is detected, in order to control a brightness control means to return the brightness of an LED component to the original brightness according to this, when there is little effect which it has on the life of an LED component, priority can be given to the brightness and the LED display with sufficient visibility can be performed.

[0005]

[Embodiment of the Invention] Hereafter, the gestalt of 1 operation of this invention is explained to a detail based on a drawing. Drawing 1 is the block diagram showing the outline configuration of the LED brightness control equipment 10 in the gestalt of this operation. As shown in drawing 1 , the LED brightness control equipment 10 of the gestalt of this operation is arranged the LED component 12 and near the LED component 12, and is constituted by the temperature sensor 14 as a temperature detection means to detect the ambient temperature of an LED component, the brightness control circuit 16 as a brightness control means to control the brightness of the LED component 12 based on the temperature of the LED component 12 detected with the temperature sensor 14, etc. The LED component 12 shall constitute each pixel of the LED display panel used for the annunciator of means of transportation, such as a train, and shall make 1 pixel two kinds of LED components, red (Red) and green (Green), here, and two or more panels which have arranged this in the shape of [of 16 (length)x16 (width)] a matrix shall be used for it. A temperature sensor 14 detects the ambient temperature of the LED component 12, and is arranged near the LED component 12. The brightness control circuit 16 controls the brightness of the LED component 12 based on the ambient temperature of the LED component 12 detected with the temperature sensor 14. Although various things can be considered as the brightness control approach of the LED component 12, with the gestalt of this operation, it is made to carry out by changing the duty ratio (ratio of ON signal and an OFF signal) of the driving signal which drives an LED component. Moreover, the drive current of an LED component may be changed besides this, and brightness may be controlled. Drawing 2 is the block diagram showing the example of 1 configuration of the brightness control circuit 16 of drawing 1 . As shown in drawing 2 , the brightness control circuit 16 consists of microprocessor units (MPU) 164 to which the duty ratio of the driving signal which it is generated by the LED driver 162 which drives the LED component 12, and its LED driver 162, and is sent to the LED component 12 is changed based on the detection temperature from a temperature sensor 14. Of course, the brightness control circuit 16 is not limited to this configuration, and you may make it send out the control signal for changing the duty ratio of a driving signal to the LED driver and LED unit which were prepared out of the brightness control circuit 16, without including the LED driver 162.

[0006] Drawing 3 is the diagram having shown the result of having performed the continuous action trial of the LED component used with the gestalt of this operation, and having investigated aging of luminous intensity. The axis of abscissa of drawing 3 expresses test time (Hrs), and the axis of ordinate expresses the rate (%) that the luminous intensity of an LED component changes according to lighting time amount. The line A in drawing 3 is a diagram under the conditions whose ambient temperature (Ta) is 25**3 degrees C. Moreover, Line B Ambient temperature (Ta) is a diagram under the conditions which are 60**3 degrees C. Line C Ambient temperature (Ta) is a diagram under the conditions which are 70**3 degrees C. Line D Ambient temperature (Ta) is a diagram under the conditions which are 80**3 degrees C, Line E is a diagram under the conditions whose ambient temperature (Ta) is 90**3 degrees C, and Line F shows the diagram under the conditions whose ambient temperature (Ta) is 100**3 degrees C. Moreover, all driver voltages (Vcc) should drive the Measuring condition by 5.0V under the 25**3-degree C condition. And in Line A - Line F in drawing 3 , what showed the actual measurement result has drawn test time as the continuous line to 1000H (time amount), and it has drawn with the broken line after it for the presumed line. lighting control of two kinds of LED components (red, green) which constitute 1 pixel from a gestalt of this operation -- "-- red LED lighting -- each point LGT mode of -> green LED lighting ->2 color-dot LGT (orange) -> non-LGT" is repeated for every fixed time amount, and it is made to perform it.

[0007] Next, brightness control actuation of LED is explained. With the gestalt of this operation, as shown in drawing 3 , let it be the life (life) of an ideal for that luminous-intensity aging of an LED component is halved to take in about ten years. Although it will have been 87,600 hours if these ten years are changed to time amount It hurts. the life of an ideal -- fixed extent -- when it became the bottom of the temperature condition which becomes short, brightness was dropped for the first time -- here The line B used as the life of about 60,000 hours (Ta:60**3 degree C) shall be made into the 1st reference temperature, and Ta=30**3 degree C which becomes shorter [the line A (Ta:25**3 degree C) which becomes twice the life (ten years) of an ideal] than 20 (175,000 hours) shall be set up as the 2nd reference temperature. Although the 1st above-mentioned reference temperature and 2nd above-mentioned reference temperature were decided as an example, the number of ambient temperature, the LED component to be used, and the LED components which constitute an LED display panel or the installation consistency of LED, and drive time amount differ from the optimum value which should be set up according to various conditions of the contents of a display. Moreover, a display subject gives top priority to the brightness of LED for whether top priority is given to the life of LED, and the method of a setup of reference temperature changes with whether a chief aim is put on the direction which raises visibility.

[0008] Drawing 4 is a flow chart explaining brightness control actuation of LED. As shown in drawing 4 , as for MPU164 of the brightness control circuit 16, the temperature judges it that detection of the ambient temperature of the LED component 12 is started by the temperature sensor 14 whether it is more than the 1st reference temperature (60 degrees C) (step S102). (step S100) When the ambient temperature of the LED component 12 is over the 1st reference temperature (60 degrees C), a duty ratio can be changed by thinning out ON signal at a fixed rate among the driving signals of the LED component 12, and the luminescence brightness of an LED component can be reduced at a fixed rate (step S104). Thus, if the brightness of an LED component is reduced, since the heating value generated from the LED component itself will become less, it changes in the direction in which ambient temperature falls. Although the ambient temperature of the LED component 12 falls gradually, lighting control by the brightness reduced at the above-mentioned step S104 is continued until it becomes below the 2nd reference temperature (30 degrees C) (step S106). In the above-mentioned step S106, since the reinforcement exceeding an ideal is obtained as shown in drawing 3 when temperature falls below in the 2nd reference temperature (30 degrees C), in order to think the visibility of an LED display as important and to turn on the LED component 12 by the usual luminescence brightness rather than a life, a duty ratio is returned to the original condition (step S108). At step S108, in case the LED component 12 is made to turn on by the usual brightness, when outside air temperature is low, the rise of the ambient temperature of an LED component is also suppressed, but if outside air temperature is high, ambient

temperature will rise with the heat generated itself gradually. Here, while it is judged whether it is step S102 more than return and the 1st reference temperature (60 degrees C) and having not become more than the 1st reference temperature (60 degrees C), lighting control of the LED component 12 is carried out by the usual brightness (step S108). In step S102, when it becomes more than the 1st reference temperature (60 degrees C), actuation not more than [above-mentioned] step S104 will be repeated.
[0009] Since according to the gestalt of this operation the temperature sensor arranged near the LED component detects the temperature of an LED component and the brightness of an LED component is controlled by the brightness control circuit, as explained above, while the ambient temperature of an LED component goes up too much and making it a life not become short, brightness can be raised as much as possible and visibility can be made good. Moreover, according to the gestalt of this operation, since a brightness control circuit will be controlled to reduce the brightness of an LED component at a fixed rate if the temperature to which a temperature sensor exceeds the 1st reference temperature is detected, it can carry out reinforcement of the LED component. Furthermore, if the temperature to which a temperature sensor is less than the 2nd reference temperature is detected, since a brightness control circuit will be controlled to return an LED component to the original brightness according to the gestalt of this operation, when there is little effect which it has on the life of an LED component, priority can be given to brightness and the LED display with good visibility can be performed. In addition, although the case where made the 1st reference temperature into 60 degrees C, and the 2nd reference temperature was set up as 30 degrees C was mentioned as the example with the gestalt of this operation, such reference temperature is not limited to the above-mentioned example, and can set the optimum value according to various situations as arbitration.
[0010]
[Effect of the Invention] As explained above, according to invention according to claim 1, a temperature detection means is arranged near the LED component. Since the brightness of an LED component was controlled based on the temperature which detected the temperature of an LED component and was detected with the temperature detection means with the brightness control means While the ambient temperature of an LED component goes up too much and making it a life not become short, at the temperature which does not have a bad influence on a life, it can return to the usual brightness and visibility can be made good. According to invention according to claim 2, since it will control to reduce the brightness of an LED component at a fixed rate if the temperature to which a temperature detection means exceeds the 1st reference temperature is detected, as a brightness control means does not exceed the 1st reference temperature which has big effect on the life of an LED component, it can attain reinforcement of an LED component. If the temperature to which a temperature detection means is less than the 2nd reference temperature lower than the 1st reference temperature is detected, since a brightness control means will be controlled to return the brightness of an LED component to the original brightness according to invention according to claim 3, when there is little effect which it has on the life of an LED component, priority can be given to the brightness and the LED display with sufficient visibility can be performed.

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DESCRIPTION OF DRAWINGS

[Brief Description of the Drawings]
[Drawing 1] It is the block diagram showing the outline configuration of the LED brightness control equipment in the gestalt of this operation.
[Drawing 2] It is the block diagram showing the example of 1 configuration of the brightness control circuit of drawing 1 .
[Drawing 3] It is the diagram having shown the result of having performed the continuous action trial of the LED component used with the gestalt of this operation, and having investigated aging of luminous intensity.
[Drawing 4] It is a flow chart explaining brightness control actuation of LED.
[Description of Notations]
10 LED Brightness Control Equipment,
12 LED Component,
14 Temperature Sensor (Temperature Detection Means),
16 Brightness Control Circuit (Brightness Control Means),
162 LED Driver,
164 MPU.

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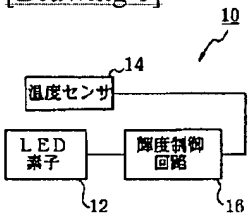
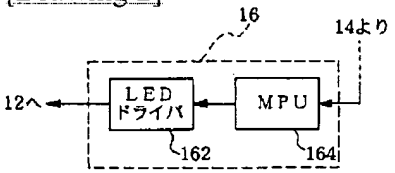
DRAWINGS

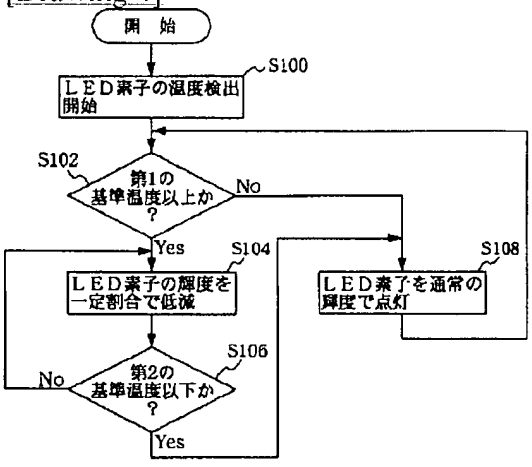
[Drawing 1]



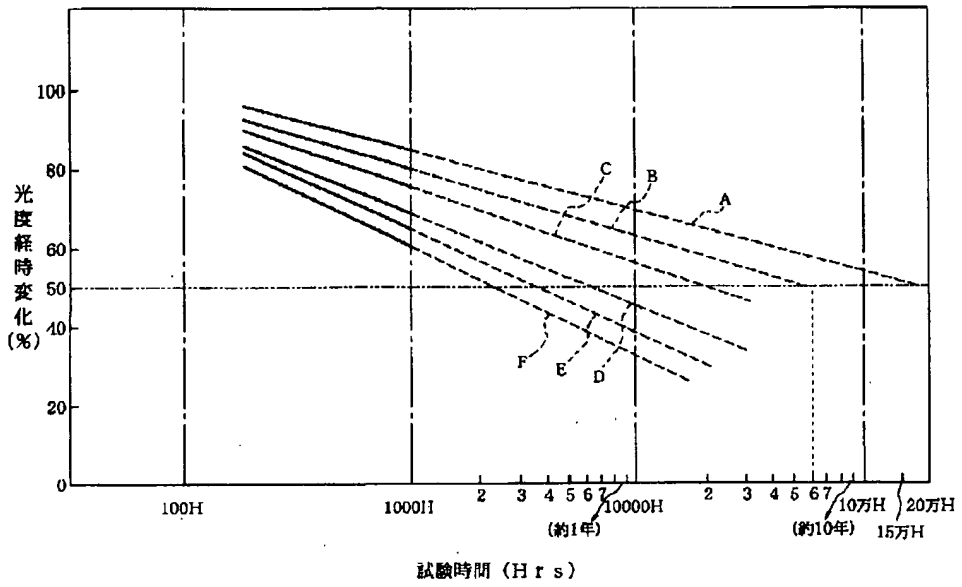
[Drawing 2]



[Drawing 4]



[Drawing 3]



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